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IS 1378 (1987): Oxidized-copper finishes [MTD 7: Light Metals and their Alloys]

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(Reaffirmed 2006)

Indian Standard

SPECIFICATION FOR OXIDIZED-COPPER FINISHES

(Third Revision)

Metallic and Non-Metallic Finishes Sectional Committee, SMDC 23 [Ref Doc: SMDC 23 (3106)]

1. Scope — This standard prescribes requirements for oxidized-copper finishes on articles made of zink and zinc alloys, steels, copper and copper alloys.

2. Terminology — For the purpose of this standard, the following définition shall apply.

2.1 *Significant Surface* — A significant surface is defined as that part of the surface of an article which is required to be given an oxidized copper finish for the sake of appearance or serviceability of that article.

Note — Portions of the article to be designated as significant surfaces shall be subject to agreement between the purchaser and the supplier.

3. Classification — The oxidized-copper finishes on different basis metals and the corresponding minimum thickness of copper plating shall be as given below:

Basis Metal	*Minimum Thickness of Copper Plating Prior to Oxidizing*	*Minimum Thickness of Copper Plating After Oxidizing*
	µm	µm
Zinc and zinc-base alloys	40	38
Steel	25	23

Note — In case of copper base alloys, a flash coating of copper may be given prior to oxidizing, if necessary.

4. Thickness Test for Copper Plating of Oxidized Finished Material

4.1 Clean the sample with an organic solvent, such as trichloroethylene, and then with dilute sodium hydroxide solution to remove oil, grease and paint.

4.2 Remove the copper oxide layer by dipping in dilute hydrochloric acid (1 : 1).

4.3 Measure the thickness of the copper coating by any of the methods specified in IS : 3203 - 1982 'Methods of testing local thickness of electroplated coatings (*first revision*)' or IS : 6012 - 1970 'Method for measurement of coating thickness by eddy current.'

Note — Any lacquer coating applied over the copper plating should be removed before the test.

5. Oxidizing and Bronzing

5.1 Oxidizing and bronzing may be done by using the process given in Appendix A or any of the conventional processes to produce an oxidized coating on copper and copper plated articles. The processed parts shall be thoroughly cleaned before and after processing. The coating may not produce any dimensional change of the treated parts.

5.1.1 The shades of colour produced by the bronzing processes depend on the form of the copper, for example, electroplated or cast, and the way it has been pre-treated, for example polished or annealed. For reproducible colours, the pre-treatment should always be similar.

5.2 *Finish* — The finish shall be uniform, adherent and free from any defects which are detrimental to its use.

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5.2.1 The gloss may be subject to agreement between the supplier and the purchaser. When finished part is to be coated with lacquer conforming to IS : 349 - 1981 'Specification for lacquer, cellulose nitrate, clear, finishing, glossy for metal (*first revision*)', there shall be a slight change in the shade of bronze finish and it may be necessary to change the bronzing conditions to allow for this fact.

6. Sampling

6.1 *Lot* — A lot shall consist of the articles, parts or components, approximately of the same size, shape and processed at one time in the same bath.

6.1.1 For the purpose of acceptance, a lot shall be divided into sub-lots of 100 articles or part thereof. Samples shall be taken from each sub-lot for ascertaining the conformity of the sub-lot to the specified requirements.

6.2 *Criteria for Acceptance* — If these samples pass the tests, the sub-lot represented by them shall be accepted. If one or both the samples fail, two further samples shall be selected from the same sub-lot and subjected to the tests. If these samples pass the tests, the sub-lot shall be accepted. If any of the second set of samples fails in any test, the sub-lot shall be rejected.

6.3 *Separate Specimen* — When processed articles cannot be subjected to any of the specified tests, two specimens of the same basis metal conforming in size and shape of the article, as far as possible, should be plated along with the article under identical conditions for the purpose of testing.

7. **Marking** — Articles with oxidized-copper finish shall be marked with the class and thickness of the copper coating given prior to oxidizing.

7.1 *Standard Marking* — Details available with the Bureau of Indian Standards.

APPENDIX A

(*Clause* 5·1)

METHODS FOR OXIDIZING AND BRONZING FOR COPPER

A-1. Immersion Processes

A-1.1 *Brown Shades (Florentine Bronze)* — This process is applicable to articles made of copper or having a coppered surface and is extensively used for finishing medallions, ornamental plaques, metal bases and a variety of domestic and electrical fittings.

A-1.1.1 *Bronzing solution* — Dilute 3-6 ml of ammonium hydrosulphide to one litre.

A-1.1.2 *Procedure* — The articles, on removal from cleaning or plating bath, are swilled well in clean cold water and then immersed in a bronzing solution. This solution is contained in a steel or plastic vessel and is used cold. The articles are immersed for a few seconds only and must be kept moving, swilled in cold water and wet scratch brushed with a fine brass wire wheel. After this, the articles are re-immersed in the bronzing solution, taken out, rinsed well in cold water, then put through boiling water, dried and again scratch brushed with the same type of wire wheel but used dry instead of wet. Finally, the articles should be lacquered with a clear or slightly tinted lacquer to preserve the finish. The purpose of double bronzing and scratch brushing operation is to ensure an even tone, the colour being patchy and very iridescent if the process is restricted to a single dip in the bronzing solution.

Note 1 — When wet scratch brushing 5 ml/l of detergent may be added to the water used, to act as a lubricant. The usual brushing speed should be 1 400 to 1 600 rpm ; higher speeds would tend to frost the surface.

Note 2 — For the final dry scratch brushing of the bronzed finish, a speed of 1 500 to 1 800 rpm is recommended; with higher speeds, there may be dragging or tearing of the bronzed finish.

A-1.2 *Dark Brown to Black (Oxidized Copper Finish)* — This process is very similar to the preceding one, both finishes depending upon the production of a dark film of copper sulphide on the surface of the metal. In this instance, a more concentrated solution is necessary.

A-1.2.1 *Bronzing solution* — Dilute 12-25 ml of ammonium hydrosulphide. Dilute 12-25 ml of ammonium hydrosulphide or alternatively 12-25 g of potassium polysulphide (potash sulphuret) to one litre where an intensely black finish is required 3 ml/l of 0·880 sp gr ammonia should be added to the above solutions. This is used cold and should be contained in a steel or plastic vessel.

A-1.2.2 *Procedure* — The coppered articles are taken direct from the plating vat, swilled well in cold water and placed in the bronzing solution, in which they should be kept constantly moving. A few seconds immersion will suffice to give a dark chocolate shade, but if a blue-black finish is required as is usually the case in copper 'oxidizing', the articles should be allowed to remain a little longer until a dirty slate colour is obtained. On removal from the bronzing solution, the articles are swilled thoroughly in cold water, rinsed in clean boiling water and then dried by means of warm boxwood sawdust or spontaneously in air afterwards, they are dry scratch brushed with a fine brass wire wheel to remove any bloom from the surface and reveal the true colour of the bronze finish. The articles are then relieved, if necessary, with satene composition, peerless polish or pumice and are finally lacquered with Ercalene lacquer.

EXPLANATORY NOTE

For imparting oxidized-copper finish, basis metal is plated with copper, dipped in an oxidizing liquid and if necessary protected by a lacquer coating. Oxidized-copper finish is used as a decorative finish on fans, switches, builder's hardware, furniture fittings and other domestic wares. Since oxidized copper finish is very sensitive, the articles should be degreased perfectly. Depending on the ultimate finish, the basis surface may be polished or otherwise.

This standard was first published in 1959, and subsequently revised in 1967 and 1979. In this present revision, the oxidizing and bronzing processes for copper or one having a coppered surface have been included and are given in Appendix A.

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